

Appl. No. : 10/821,580  
Filed : April 9, 2004

**AMENDMENTS TO THE SPECIFICATION**

**Please amend the Specification as follows. Insertions are shown underlined while deletions are ~~struck through~~.**

Page 1, paragraph [0001]:

The present invention relates to a diversity antenna apparatus that ~~are~~is used, for example, in radio communication systems.

Page 1, paragraph [0005]:

Japanese Unexamined Patent Application Publication No. 62-114304 and Japanese Unexamined Patent Application Publication No. 4-133502 disclose arrangements in which a plurality of antennas is disposed on a substrate and in which directivity is changed based on gaps among the antennas and phase differences of voltages.

Page 1, paragraph [0007]:

In a microstrip antenna disclosed in Japanese Unexamined Patent Application Publication No. 2003-8337, a ground conductor that is substantially square and planar is disposed so that the four edges thereof extend in a horizontal or vertical direction, and a planar radiating element is disposed so as to overlap a side surface of the ground conductor via a dielectric member, so that emission of linearly polarized waves, at least one of the vertically polarized waves and horizontally polarized waves, is allowed. With the microstrip antenna, uniformity between a transmission/reception area for horizontally polarized waves and a transmission/reception area for vertically polarized waves is achieved.

Page 2, paragraph [0009]:

However, the arrangements disclosed in the documents mentioned above are either a planar antenna in which an antenna element that functions as a radiating element is disposed on an antenna ground, ~~that are composed of~~ing a micro strip structure in cooperation with each other, or a pole antenna in which a radiating element is disposed vertically with respect to an antenna ground. This has imposed restrictions on reducing the thickness and size of antennas.

Appl. No. : 10/821,580  
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Page 2, paragraph [0011]:

Furthermore, the antenna devices according to the No. 11-215040 and No. 2003-8337 are not sufficient for use in multipath environments, because they do not disclose the relation between vertically/horizontally polarization and a transmitting/receiving antenna setting. This aspect is peculiar to an embodiment of the present invention. Especially, No. 2003-8337 discloses the use of vertically/horizontally polarization in order to correspond to both a vertically polarization service area and a horizontally polarization service area. Therefore, No. 2003-8337 does not have the specific setting of an embodiment of the present invention in which vertically polarization is applied to the transmitting antenna.

Page 3, paragraph [0014]:

One approach to achieve the first object described above is to employ a coplanar antenna in which an antenna element and a ground pattern are disposed on the same plane or substantially on the same plane, so that very little space is needed in the height direction. However, an area of a certain size is needed to dispose the antenna element and the ground pattern together. Since the entire area including the antenna element and the ground pattern affects electrical efficiency, the antenna element can have a small size compared with a case of a planar antenna, serving to reduce the size of the two-dimensional area of an antenna element. Therefore, the total area for arranging a plurality plurality of antenna elements can be decreased. Another approach to achieve further reduction in size is to share a ground pattern among a plurality of antenna elements included in the diversity antenna apparatus. However, since certain gaps are needed between the ground pattern and the antenna elements in a coplanar antenna, a ground pattern cannot be shared by the same method as in a planar antenna or a pole antenna. Accordingly, the present invention includes, but is not limited to, the following arrangements.

Page 7, paragraph [0032]:

Also, according to an embodiment of the present invention, a diversity antenna apparatus that is suitable for use in multipath environments can be provided. [0000]— In the foregoing, elements and explanation in each aspect can be interchangeably used in another aspect.

Page 9, paragraph [0048]:

Although the larger the gaps between the chip antennas 10a to 10f and the ground pattern 14, the better the transmitting/receiving efficiency becomes, preferably it may be minimized without causing impedance mismatching, so that the device can be downsized. The desired distance depends on the type of the antennas. For example, in the case of inverse-F antennas, the distance can be as small as approximately 1 mm. (e.g., at 2 GHz Band).

Page 15, paragraph [0071]:

Fig. 7 shows the results of an experiment in which two diversity antenna apparatuses constructed as shown in Fig. 6 were used, wherein the two diversity antenna apparatuses are disposed at a mutual distance of 10 m or 35 m, the transmitting chip antenna of one of the diversity antenna apparatuses outputting radio waves of 13 dBm at 5.25 GHz and the receiving chip antennas of the other diversity antenna apparatus receiving the radio waves. This experiment was carried out in a typical office environment. In this experiment, assuming that the diversity antenna apparatuses make an angle of 0° when opposed to each other, the receiving diversity antenna apparatus was rotated by 0°, 90°, 180°, and 270°, and for each of the rotation angles, average values (dB) of the voltage received were measured using one, two, three, four, and five receiving chip antennas. In all cases, the variation in the average value of the voltage received was as small as approximately 2 dB even when the number of receiving chip antennas was changed. Furthermore, the variation in the average value of voltage received was as small as approximately 3.5 dB even when the angle was changed. As described above, variation in the receiving characteristics is small, so that favorable communications are allowed even in multipath environments.